PATENT SPECIFICATION

Application Date: May 13, 1921. No. 13,668/21. **177,433**

Complete Accepted: Mar. 30, 1922.

COMPLETE SPECIFICATION.

Improvements in or relating to Current-collecting Shoes.

We, JAMES DENIS TWINBERROW, of 12, Homesdale Road, Bromley, Kent, subject of the King of England, and HUBERT ERNEST GAZE, of "Jesmond", Pollards Hill North, Norbury, Surrey, subject of the King of England, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention consists in improvements in or relating to shoes such as are used on electrically-driven vehicles for collecting current from live or conductor-rails. It is known that in electric traction systems, where the contact surface is in a horizontal plane, two main systems for collection of current from a live or conductor-rail are employed. In one system the live rail is of the under-contact type, that is to say it is a rail in which an under, or downwardly-directed surface serves as the working surface. In the other system the upper surface of the rail serves as the working surface. In each system a collecting shoe is employed held in sliding engagement with the working surface of the live rail, the shoe being carried on a part, generally the undercarriage of a vehicle, means being provided to allow vertical movement of the shoe whereby it can accommodate itself to small variations in the level of the live or conductor rail. Generally in the under-contact system a spring is employed to hold the shoe in contact with the under working surface, whereas in the other, or top, contact system sometimes the weight of the shoe and its attendant parts has alone proved sufficient to effect good contact, or in other cases, a light spring has been employed tending to hold the shoe on to the contact surface of the rail.

[Price 1/-]

In some cases it is desirable to run a vehicle, for a part of its journey, over a track furnished with one system, and for the rest of its journey over a track furnished with the other system. For this purpose it has been found necessary to provide on one and the same vehicle two sets of shoes and shoe-gears, one shoe for the under contact system and the other shoe for the top contact system, or else to provide a shoe which may be manipulated or adjusted by an attendant in order to change over from one type of rail to the other. The main object of the present invention is to provide a single shoe and a shoe-gear which is adapted for use with either system and which will run readily from one system to the other without requiring any manipulation on the part of the attendant.

According to the present invention a contact-shoe is so mounted that it is free to operate through two distinct ranges of levels and is combined with a spring or springs to control the movements of the shoe so as normally to tend to maintain it in a mid-position and to resist movement at least in a downward direction from the mid-position. The purpose of such a combination is that in the mid-position the shoe is ready either to ride up on to the top contact conductor-rail or to ride down beneath the working surface of an under-contact conductor-rail, and in order to facilitate the engagement with the rail the forward and after ends of the shoe are preferably chamfered.

In one preferred construction according to the invention, the shoe is carried as an extension from the lower extremity of a vertically-disposed side member of a swinging parallel-link frame.

A feature of the invention consists in the provision of two control-springs for the shoe whereof one spring resists vertical movement of the shoe in a downward direction, and the other resists vertical movement of the shoe in the upward direction. The spring which resists downward movement of the shoe serves generally to counteract the weight of the moving parts as well as to resist downward pressure when the shoe is engaged with a conductor-rail of the under-contact type. The other spring serves to keep the shoe steady when hanging in a free position and to prevent chattering of the shoe in running and may, if necessary, be such as to exert a comparatively light pressure on the shoe in a downward direction when the shoe is working in conjunction with a top contact rail. The spring thus serves to maintain an even pressure of the shoe on the rail when the vehicle carrying the shoe is in motion. The spring which resists downward movement is more powerful than that which resists upward movement.

The foregoing and other features of the invention will be more fully understood from the following description, given by way of example only, with the aid of the accompanying drawings, in which—

Figure 1 is a section through the shoe and shoe-gear in its application to an under-contact rail;

Figure 2 is a perspective view, in elevation, of the parts shown in Figure 1; and

Figure 3 is a similar view with the shoe shown as co-operating with a top-contact conductor-rail.

Like reference numerals indicate like parts throughout the drawings.

The shoe proper is indicated at 1 as being formed at the end of an angled member 2. Both upper and lower faces of the shoe afford good contact surfaces and its forward and after ends are conveniently chamfered. The upper extremity of the angled member 2 is bolted at 3 to the lower extremity of a vertically-disposed side member 4 of a swinging parallel-link frame pivotally connected to the free ends of upper and lower links 5 and 6 whose opposite extremities are pivotally connected to a bracket 7.

The bracket 7 is adapted for connection to the vehicle, by means of the customary wooden shoe-beam 10 attached to the axle-boxes of neighbouring axles or by other known or preferred means. The beam 10 serves to support a cylindrical casing 11 which encloses or surrounds the control springs, and is formed or fitted with lugs 18 to receive bolts 19.

In the construction illustrated the lower link 6 is pivotally connected to a rod 12 whose upper end is seated, by means of a member 13 having a spherical bearing on the upper end of a tubular plunger 14 whose lower end is flanged and engages with the upper end of a control spring 15. The other end of this spring is received within an upturned annular part of the casing 11 and the spring serves to resist downward movement of the shoe.

In order to maintain the gear, when running free, in firm contact upon the seating of the spherical bearing, a lighter spring 16 is provided, the ends of which are engaged respectively with the underside of the flange of the plunger 14 and a shoulder 17 on the rod 12 as shown.

When the shoe 1 is engaged with a conductor-rail of the under-contact type, as shown in Figures 1 and 2, the spring 15 is compressed beyond its normal compression and, as will be readily appreciated, exerts an upwardly-directed force tending to maintain the shoe in close contact with the conductor-rail shown.

When, as illustrated in Figure 3, the shoe engages with a conductor-rail of the top-contact type, the spring 15 will have been restored to its normal position with the plunger 14 in its upper limiting position and the spring 16 will have been compressed beyond its normal compression between the shoulder 17 and the under surface of the plunger 14.

Whereas a comparatively powerful or stiff spring 15 is necessary to neutralise the effect of gravity and to maintain the shoe in firm contact with the under-contact rail, the weight of the parts is sufficient for providing the normal pressure on a top-contact rail and only a comparatively light spring 16 is required to check any tendency to chatter. In fact this spring may, if desired, be dispensed with entirely.

If the shoe were engaged with neither of the conductor-rails the spring 15 would expand to its full limit allowed by the casing 11 and the shoe would be held in a position mid-way between its two working positions (as shown in chain-lines in Figure 1). Thus, if both types of conductor-rails are formed with ramps at their ends, the shoe will be in such a position as to engage either of the ramps so as to be drawn down for the under-contact rail or moved upwardly for

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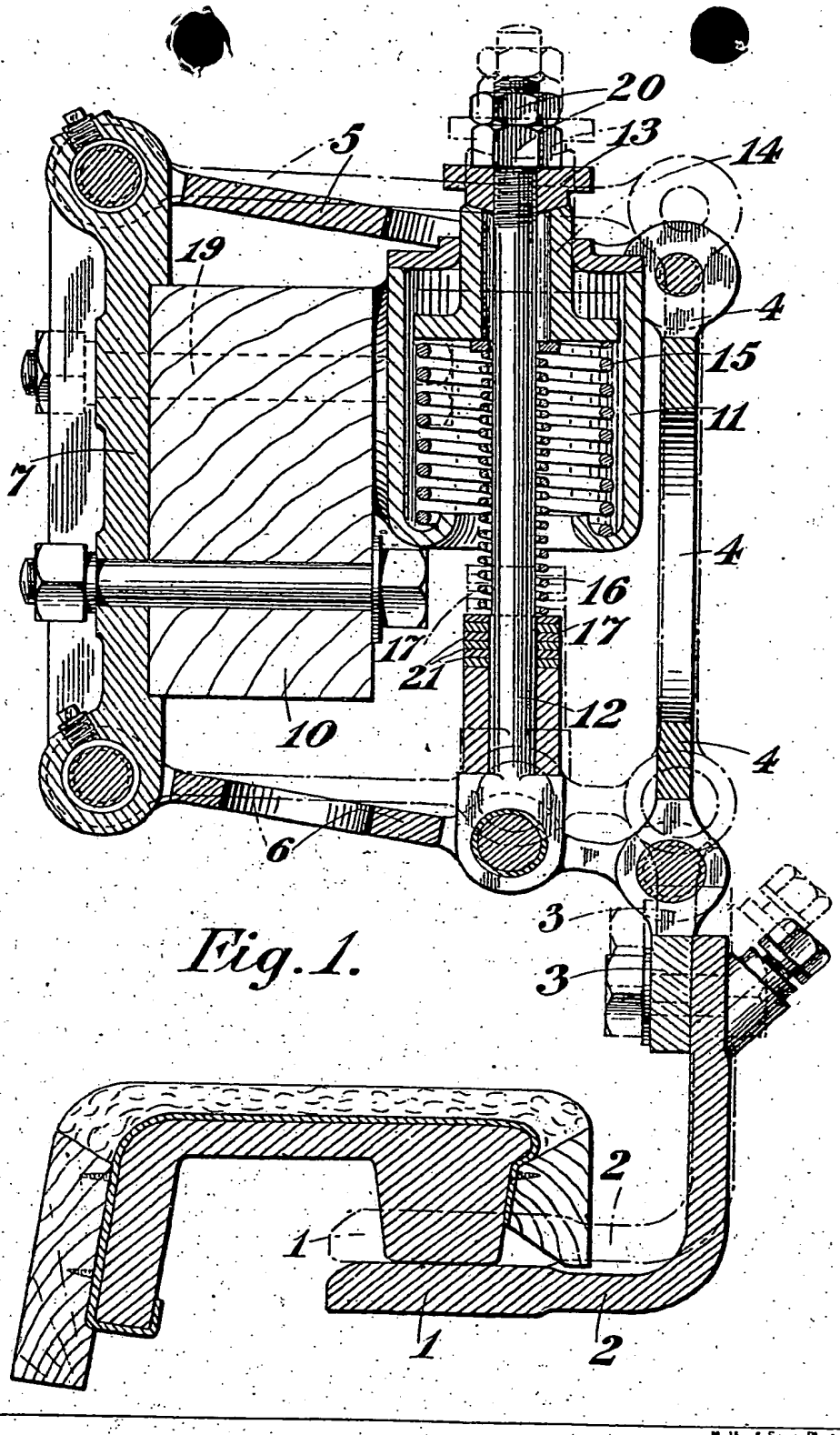

Fig. 1.

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the top-contact rail. The chamfering of the forward and after ends of the shoe assists in its engagement with the rail-ramps. One such ramp is shown in Figure 3 for the top-contact rail and it will be understood that corresponding, but reversed, ramps will be provided at the end of the under-contact rail.

The shoe 1 and its angled member 2 are preferably made of material which is inferior in tensile strength to that of the material of the members of the swinging link frame. Thus, if an obstruction should accidentally be encountered, the angled member will shear or snap without necessarily damaging the link frame and a fresh shoe can readily be secured at 3 to the link frame. If the shoe and its angled part were formed integral with the link 4 or of material having the same tensile strength as that of the link 4, damage might result in the shoe-gear as a whole, which would necessitate not only considerable expense in replacement but also considerable waste of time as compared with that which would be required with the present construction.

In order to provide for variations in the height of the beam to which the shoe-bracket is attached, such variations being due to the wear of tyres, journal bearings, *etc.* the height of the shoe should be adjusted relatively to the bracket without necessitating the disengagement of the holding down bolts or other parts. The adjustment is effected by rotating the lock-nuts 20 immediately above the member 13, thus imparting a vertical travel to the spindle 12 without affecting the degree of compression on the main spring 15. The light auxiliary spring 16 is of such range that its action is not seriously affected by moderate degrees of adjustment, but when making large adjustments the normal compression on the small spring may be retained by removing a number of the washers 21 from the shoulder 17 of the spindle 12 and placing them between the lock-nuts 20 and the upper face of the member 13. Should it be necessary to readjust the shoe to suit a higher position of the bracket, an equivalent number of loose washers would be removed from beneath the lock-nuts 20 and restored to their position above the shoulder 17.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A contact-shoe of the type described so mounted that it is free to operate at two distinct levels combined, for the purpose described, with a spring or springs to control the movements of the shoe so as normally to tend to maintain it in a mid-position and to resist movement at least in a downward direction from the mid-position.

2. A construction of the subject-matter of Claim 1 wherein the shoe is carried as an extension from the lower extremity of a vertically-disposed side member of a swinging parallel-link frame.

3. The subject-matter of Claim 1 characterised by two controlling-springs whereof one (for example 15) resists vertical movement of the shoe in a downward direction and the other (for example 16) resists vertical movement of the shoe in the upward direction, the spring which resists downward movement being more powerful than that which resists upward movement.

4. The subject-matter of Claim 1 wherein the contact-shoe is secured to the lower portion of a substantially vertical depending arm and is formed of material of interior tensile strength as compared with that of the said depending arm, for the purpose described.

5. A contact-shoe according to Claim 1 having means to adjust its normal hanging position in relation to its support, said means comprising the combination with the spring aforesaid for resisting downward movement of the shoe of a substantially vertical spindle (for example the spindle 12 passing through the interior of, and co-axial with, the springs 15 and 16) which, at or near one of its ends is operatively connected with and serves to suspend the shoe and at or near its other end is operatively connected with the said spring, and means (for example the lock-nuts 20) to adjust the position in the height of the spindle at which it is engaged with the spring.

6. A shoe and shoe-gear substantially as described with reference to the accompanying drawings.

Dated this 13th day of May, 1921.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C. 1,
Chartered Patent Agents.

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Fig. 2.

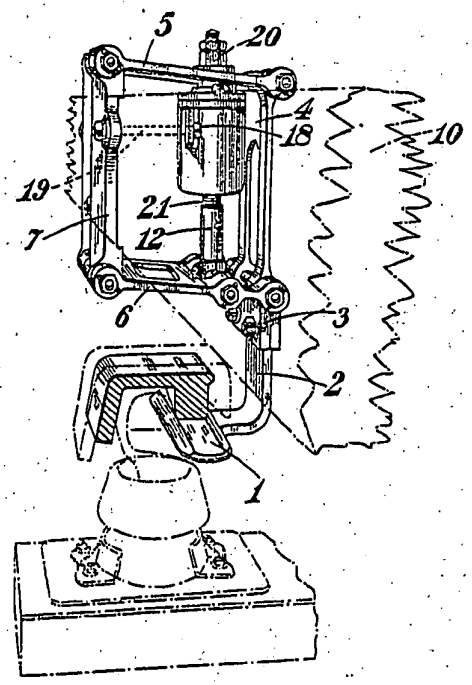

Fig. 3.

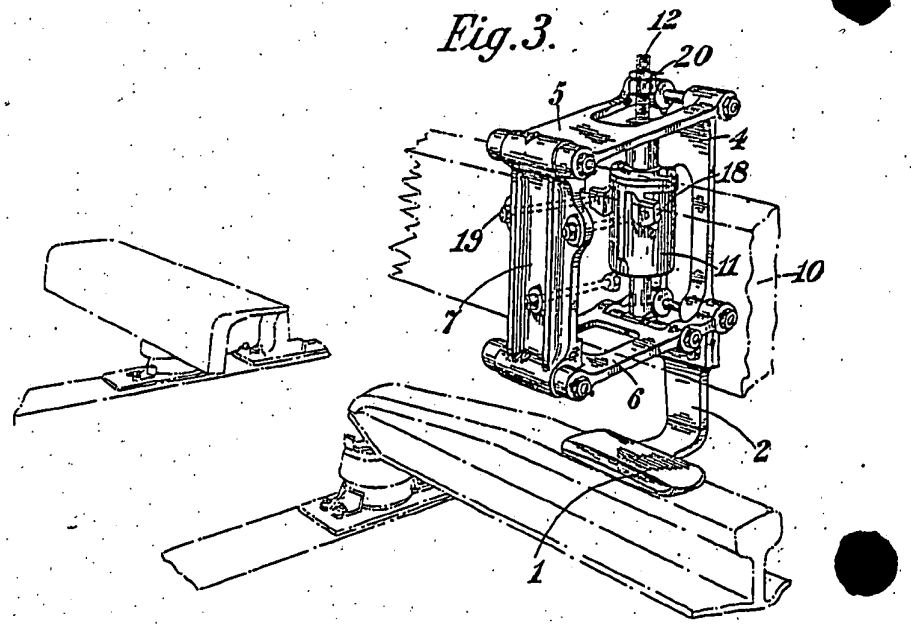

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Fig. 2.

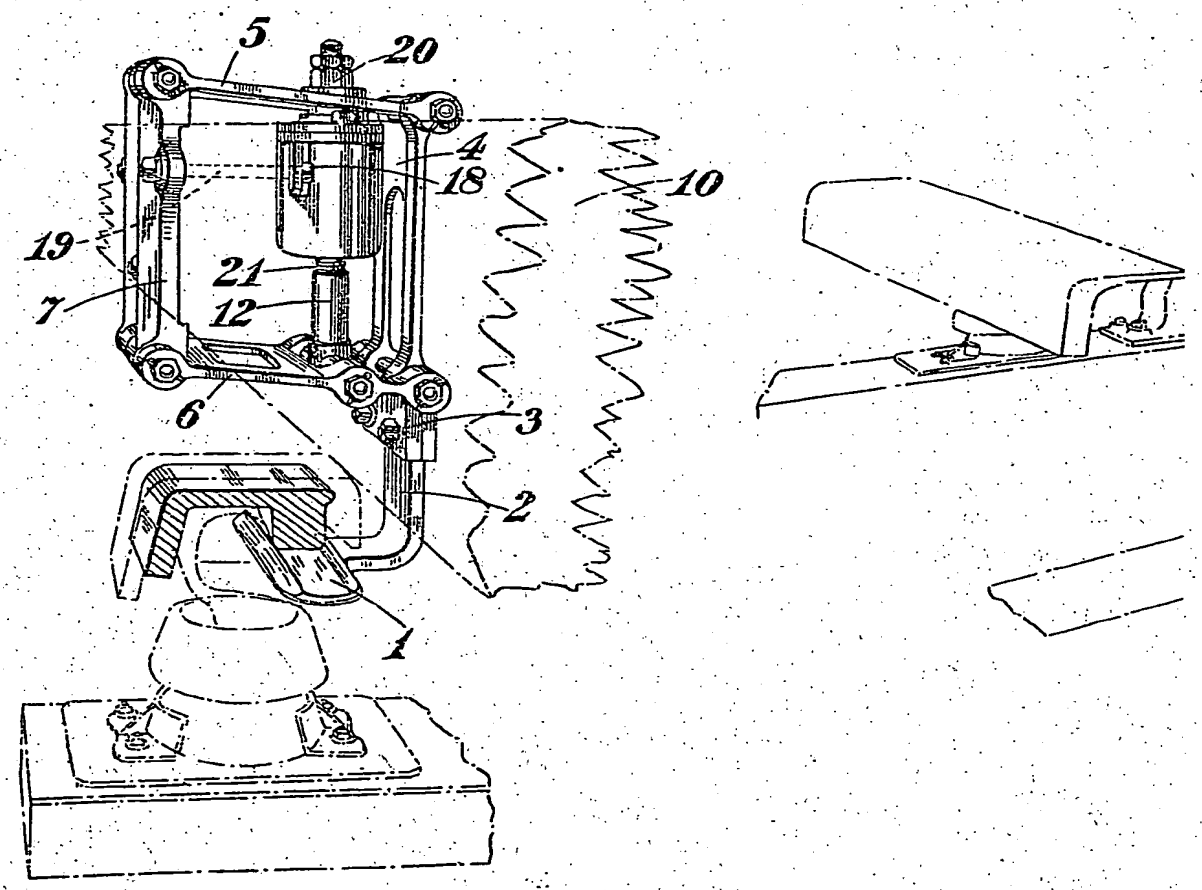
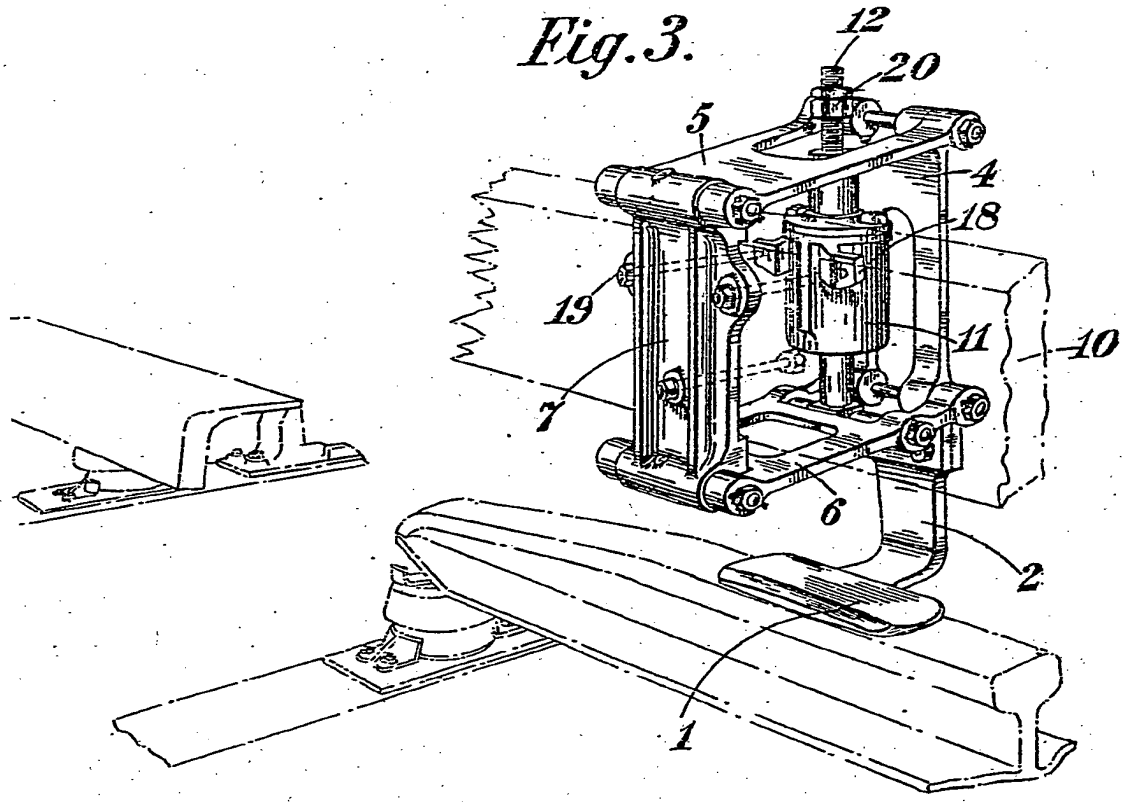


Fig. 3.



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